US009409120B2

(12) **United States Patent**
Liu et al.

(10) **Patent No.: US 9,409,120 B2**
(45) **Date of Patent: Aug. 9, 2016**

(54) **HYBRID PROCESS USING A MEMBRANE TO ENRICH FLUE GAS CO_2 WITH A SOLVENT-BASED POST-COMBUSTION CO_2 CAPTURE SYSTEM**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/591,392**

(22) Filed: **Jan. 7, 2015**

(65) **Prior Publication Data**

US 2015/0190748 A1 Jul. 9, 2015

Related U.S. Application Data

(60) Provisional application No. 61/924,373, filed on Jan. 7, 2014.

(51) **Int. Cl.**

B01D 53/22	(2006.01)
B01D 53/14	(2006.01)
F01K 23/06	(2006.01)

(52) **U.S. Cl.**

CPC ..... ***B01D 53/229*** (2013.01); ***B01D 53/1425*** (2013.01); ***B01D 53/1443*** (2013.01); (Continued)

(58) **Field of Classification Search**

CPC B01D 53/1425; B01D 53/1443; B01D 53/1475; B01D 53/229; B01D 2053/221; Y02C 10/10; F01K 23/067

USPC 95/51

See application file for complete search history.

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(57) **ABSTRACT**

A process for recovery of CO_2 from a post-combustion gas includes pre-concentrating a CO_2 component of the post-combustion flue gas by passing the post-combustion gas through a CO_2-selective membrane module to provide a CO_2-enriched permeate stream and a CO_2-lean reject stream. Next, in a CO_2 absorber, both the CO_2-enriched permeate stream and CO_2 lean reject stream, fed to separate feed locations on the CO_2 absorber, are contacted with a scrubbing solvent to absorb CO_2 and provide a carbon-rich scrubbing solvent. Finally, absorbed CO_2 is stripped from the carbon-rich scrubbing solvent by a two-stage CO_2 stripping system. The CO_2-selective membrane may be a high flux, low pressure drop, low CO_2 selectivity membrane. The two stage stripping system includes a primary CO_2 stripping column for stripping CO_2 from the carbon-rich scrubbing solvent exiting the CO_2 absorber, and a secondary CO_2 stripping column for stripping CO_2 from a carbon-lean scrubbing solvent exiting the primary CO_2 stripping column. Apparatus for CO_2 removal from post-combustion gases in a pulverized coal power plant incorporating the described processes are described.

21 Claims, 5 Drawing Sheets